

## Small Form Factor Bi-Directional Transceiver Module for Gigabit Ethernet



### FEATURES

- RoHS compliant
- IEEE802.3ah Gigabit Ethernet compliant
- SFF package with bi-directional SC receptacle
- Upstream 1.25Gbps transmitter with 1490nm DFB Laser, and downstream 1.25Gbps receiver with 1310nm PIN-TIA
- Single +3.3V power supply
- LVTTTL Transmitter Enable input and Rx Signal Detect output
- Laser Class 1 Product which comply with the requirements of IEC 60825-1 and IEC 60825-2

### Description

The SFBD-1250xxxx series are 3.3V small Form Factor Bi-Directional Transceiver Module designed expressly for high-speed communication applications that require rates of up to 1.25Gbit/sec. It is compliant with the Gigabit Ethernet standards, as well as the SFF Multisource Agreement (MSA).

The module consists 1490nm DFB laser, InGaAs PIN, Preamplifier and WDM filter in a high-integrated optical sub-assembly, and it is contained in a standard SFF package with a 9/125um SC receptacle connector.

### Application

- IEEE 802.3ah 1000BASE-BX10-D
- GE-Media Converter
- Gigabit Ethernet P2P Optical Network
- FTTx WDM Broadband Access
- SFBD-1250B4Q1R data link up to 10km in 9/125um single mode fiber.

### 1. Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Storage Temperature	T <sub>s</sub>	-40		85	°C	
Storage Ambient Humidity	HA	5		95	%	
Power Supply Voltage	V <sub>CC</sub>	-0.3		4	V	
Signal Input Voltage		-0.3		V <sub>CC</sub> +0.3	V	
Receiver Damage Threshold		+3			dBm	
Lead Soldering Temperature	T <sub>SOLD</sub>			260	°C	
Lead Soldering Time	t <sub>SOLD</sub>			10	sec	

### 2. Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Ambient Operating Temperature	T <sub>A</sub>	0		70	°C	Without air flow
Ambient Humidity	HA	5		85	%	Non-condensing
Power Supply Voltage	V <sub>CC</sub>	3.13	3.3	3.47	V	
Power Supply Current	I <sub>CC</sub>			300	mA	
Power Supply Noise Rejection				100	mVp-p	100Hz to 1MHz
Data Rate		1.25 -100ppm	1.25	1.25 +100ppm	Gbps	
Transmission Distance				10	km	

### 3. Specification of Transmitter

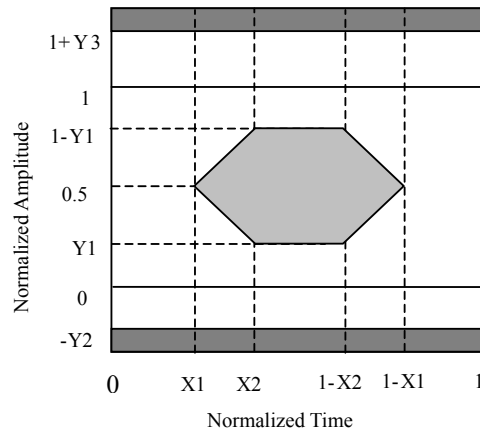
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Average Launched Power	P <sub>O</sub>	-9		-3	dBm	Note (1)
Launched power (Peak.)	P <sub>P</sub>			0	dBm	
Extinction Ratio	ER	9			dB	
Center Wavelength	λ <sub>c</sub>	1480	1490	1500	nm	DFB Laser
Spectrum Width (-20dB)	σ			0.88	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Transmitter OFF Output Power	P <sub>Off</sub>			-45	dBm	
Optical Rise/Fall Time	t <sub>r</sub> /t <sub>f</sub>			260	ps	Note (2)
Total Jitter	t <sub>J</sub>			227	ps	Note (3)
Optical Return Loss Tolerance	ORLT			12	dB	
Relative Intensity Noise	RIN <sub>12</sub> OMA			-113	dB/Hz	
Optical Transmitter Reflectance				-6	dB	
Transmitter and Dispersion Penalty	TDP			3.3	dB	
Output Eye Mask {X1,X2,Y1,Y2,Y3}	Compliant with IEEE 802.3ah {0.22,0.375,0.20,0.20,0.30}					Note (5)

Note (1). Launched power (avg.) is power coupled into a single mode fiber with master connector.

Note (2). These are unfiltered 20-80% values.

Note (3). Measure at 2<sup>7</sup>-1 NRZ PRBS pattern

Note (5). Transmitter eye mask definition



#### 4. Specification of Receiver

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Input Optical Wavelength	$\lambda_{IN}$	1260	1310	1360	nm	PIN-PD
Receiver Sensitivity	$P_{IN}$			-23	dBm	Note (1)
Input Saturation Power (Overload)	$P_{SAT}$	-3			dBm	
Signal Detect -Assert Power	$P_A$			-24	dBm	
Signal Detect -Deassert Power	$P_D$	-44			dBm	Note (2)
Signal Detect Hysteresis	$P_A - P_D$	0.5	2	5	dB	
Data Output Rise/Fall time	$t_r/t_f$			260	ps	Note (3)
Optical Receiver Reflectance				-12	dB	Note (4)
Optical Isolation from External Source	1550 to 1560nm			-33	dB	
	1640 to 1665nm			-33	dB	

Note (1). Measured with Light source 1490nm, ER=9dB; BER =  $<10^{-12}$  @ PRBS=2<sup>7</sup>-1 NRZ

Note (2). When SD deasserted, the data output is Low-level (fixed)

Note (3). These are 20%~80% values.

Note (4). Measured at wavelength of 1310nm.

#### 5. Electrical Interface Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Transmitter</b>						
Total Supply Current	$I_{CC}$			A	mA	Note (1)
Differential line input Impedance	$R_{IN}$	90	100	110	Ohm	
Differential Data Input Swing	$V_{DT}$	400		1600	mV <sub>p-p</sub>	Note (2)
Transmitter Disable Input-High	$V_{DISH}$	2		$V_{CC}$	V	LVTTTL
Transmitter Disable Input-Low	$V_{DISL}$	0		0.8	V	
<b>Receiver</b>						
Total Supply Current	$I_{CC}$			B	mA	Note (1)
Differential Data Output Swing	$V_{DR}$	400	800	1200	mV <sub>p-p</sub>	Note (2)
Signal Detect Output Voltage-High	$V_{LOSH}$	2		$V_{CC}+0.3$	V	Note (3)
Signal Detect Output Voltage-Low	$V_{LOSL}$	0		0.8	V	

Note (1). A (TX)+ B (RX) = 300mA (Not include termination circuit)

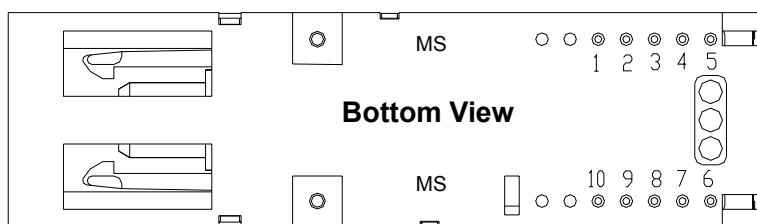
Note (2). Internally AC coupled, but requires a 100Ohm differential termination at or internal to Serializer/ Deserializer.

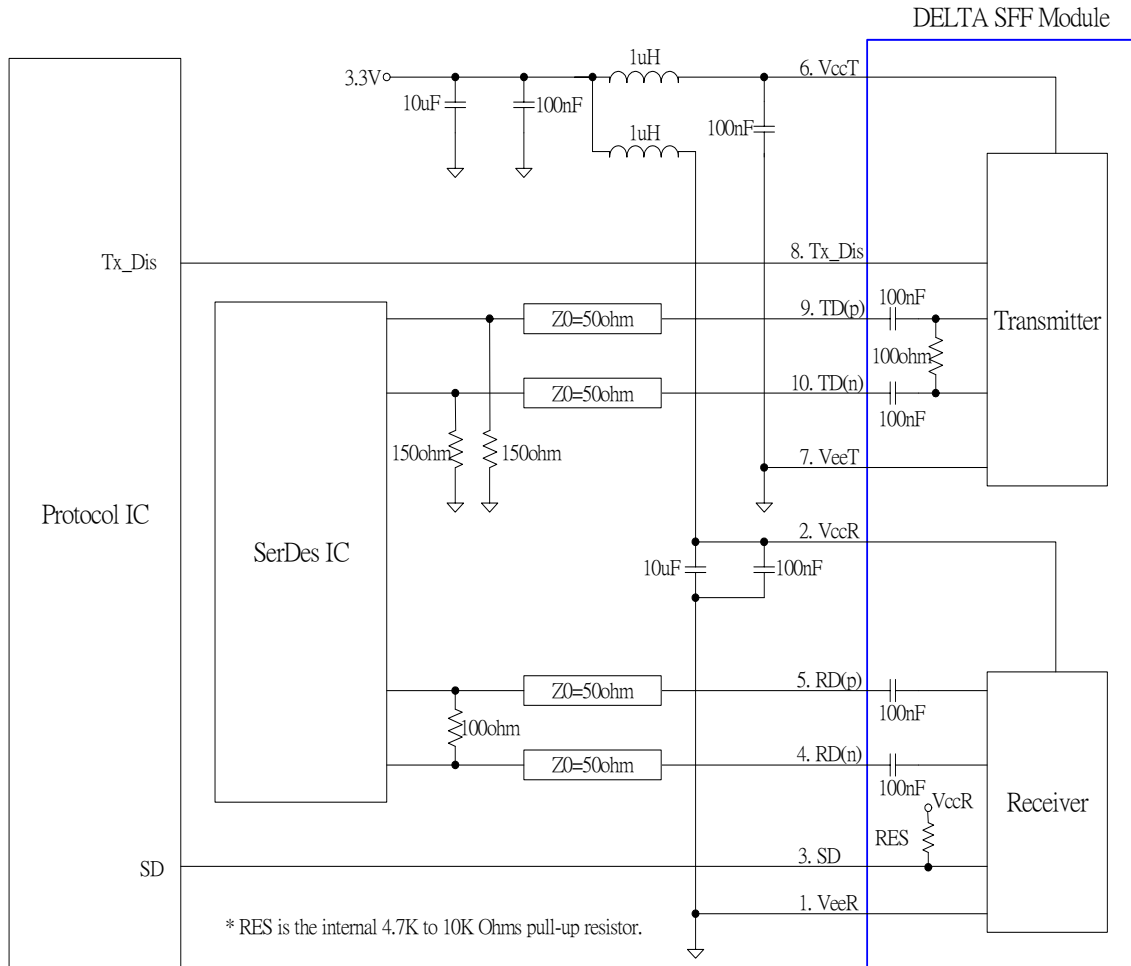
Note (3). LVTTTL logic output, internal 4.7K~10K Ohm pull-up resistor. External load on host board is unnecessary.

## 6. Pin Description

Tx/Rx	Pin No.	I/O	Pin Name	Description
Rx	1		VeeR	Receiver Ground
	2		VccR	+3.3V Receiver Power Supply
	3	O	SD	Normal Optical Input indicated by logic "High", and No Optical Input indicated by logic "Low". (LVTTTL)
	4	O	RD(n)	Inverted Receiver Data Output (AC-Coupled CML output)
	5	O	RD(p)	Non-Inverted Receiver Data Output (AC-Coupled CML output)
Tx	6		VccT	+3.3V Transmitter Power Supply
	7		VeeT	Transmitter Ground
	8	I	Tx_Dis	LVTTTL Logic "High" to Disable Transmitter, and Enable Transmitter by Logic "Low".
	9	I	TD(p)	Non-Inverted Transmitter Data Input (AC-Coupled LVPECL input)
	10	I	TD(n)	Inverted Transmitter Data Input (AC-Coupled LVPECL input)
			MS	Mounting studs/ connect this pin to Chassis ground

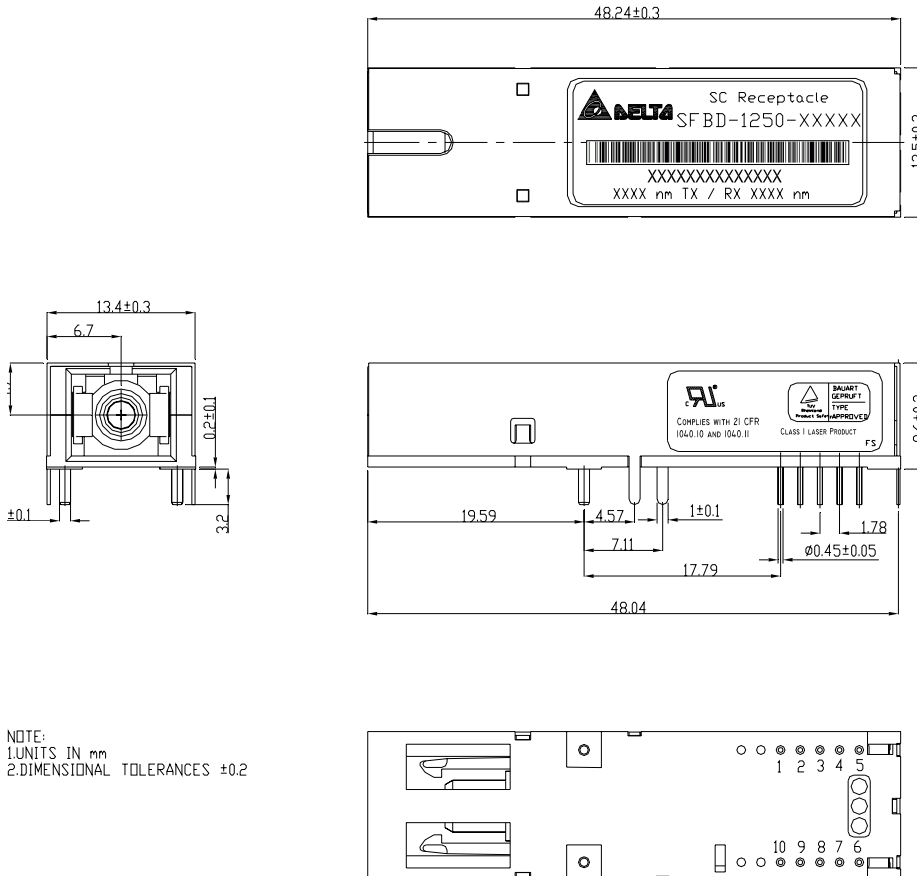
Note (1). EMI shielding lead must be connected to Signal ground



**7. Recommended Interface Circuit (AC Coupling)**


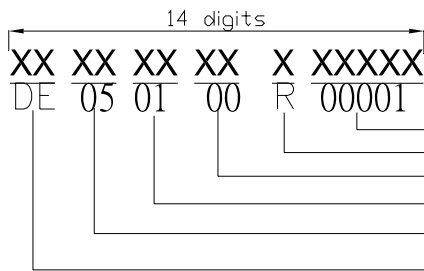
8. Outline Dimensions

Parameter	Unit	Description	Note
Mechanical Dimensions	mm	48.3x13.5x9.6	
Connector Type	-	SC/UPC connector	IEC-61754-4



NOTE:  
 1.UNITS IN mm  
 2.DIMENSIONAL TOLERANCES ±0.2

S/ N



S/N : (00001~99999)  
 Rework : Rework=R or No-rework=0  
 Vender NOTE : Free or 00  
 Week (52Weeks/Year) : 1月2日=01  
 Year : 2005=05  
 Vender CODE : DELTA=DE

**9. Regulatory Compliance**

Feature	Test Method	Reference	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	Human Body Model (HBM)	MIL-STD-883E Method 3015.7 EIA-JESD22-A114	(1) Satisfied with electrical characteristics of product spec.  (2) No physical damage
	Machine Model (MM)	EIA-JESD22-A115	
Electrostatic Discharge (ESD) to the Simplex Receptacle	Contact Discharge	IEC/EN 61000-4-2	
	Air Discharge	IEC/EN 61000-4-2	
Radio Frequency Electromagnetic Field Immunity		IEC/EN 61000-4-3	
Electromagnetic Interference (EMI)		FCC Part 15 Class B EN 55022 Class B (CISPR 22A)	
Laser Eye Safety	FDA/CDRH	FDA 21CFR 1040.10, 1040.11	CDRH File # 0420993
	TUV	IEC/EN 60825-1 IEC/EN 60825-2	TUV Certificate # R50032471
Component Recognition	TUV	IEC/EN 60950	
	UL/CSA	UL 60950	UL File # E239394

**Appendix A. Document Revision**

Version No.	Date	Description
S0	2007-04-12	Preliminary datasheet